to the reducer, and it continued to circulate between the reducing and the volatilising stages for a period which varied between seven days and fifteen days, until about 60 per cent. of the amount of nickel had been removed as nickel carbonyl. The residue from this operation, amounting to about one-third of the original calcined matte, and not differing much from it in composition, was returned to the first operation and naturally followed the same course as before. The nickel carbonyl produced in the fourth operation passed to a decomposer, which consisted either of a tower or a horizontal retort heated to a temperature of 180° C., so as to decompose the nickel carbonyl and release the nickel in the metallic form, either on thin sheets of iron or, preferably, on granules of ordinary commercial nickel. Carbon-monoxide was in turn also released, and was returned to the volatiliser for taking up a fresh charge of nickel. When the operation was in progress, the gaseous carbon-monoxide and the partially reduced oxide of nickel and copper continuously revolved in two separate circuits, which joined and crossed each other in the volatiliser. The commercial product contained 99·8 per cent. of nickel.

The author proceeded to a description of the working as he saw it in full operation in Smethwick a few months ago. The plant had been working for some time, and about 80 tons of nickel had already been extracted from different kinds of matte. The results were quite satisfactory, and pointed to the conclusion that the process was well able to compete with any other process in use for the production of metallic nickel.

The process would always occupy a prominent position in chemical history, and there appeared to be no reason why it should not play an important part in metallurgical practice. Its application in Canada to the great nickeliferous district of Sudbury would probably contribute to the development of the resources of the great Dominion.

NATURAL HISTORY NOTES FROM YUNNAN.[1]

I LEFT Mengtze in the end of January with a caravan of mules, some forty, carrying stores, &c. I had three mule-loads, *e.g.*, of silver. The journey here took eighteen days, rather easy stages. The country passed through was very varied. I was in good spirits, rode nearly all the way, and enjoyed the trip very much. I crossed three large rivers *en route* by pontoon and suspension bridges; the latter very well made, of iron rods joined by rings at the ends, the best specimens I have seen of Chinese blacksmith's work. At these river crossings we reached low levels, about 1800 feet above the sea, and came into tropical vegetation, which I never find at all interesting. At Yuenchiang, on the Red River, the ugly-looking shrub *Calotropis gigantea* was in flower, and there was a great display of the tree-cotton, *Bombax*, in flower, without any leaves, looking like an artificial candelabrum affair more than a living tree. These and some *Areca* palms were the only things of note. At the higher levels vegetation was at a dead point and I collected very little, one or two species of *Clematis*, two Rhododendrons: the very curious *Scolopendrium Delavayi*, which I had never seen before, I found one day on a shady bank where I stopped for tiffin. I also found, at the same place, two plants of *Abutilon sinense*, which had been sent by me from Ichang, and an *Antrophyum*, which may be new. I also came across *Lonicera Bournei* in flower; it is of no value as an ornamental plant. There was very little forest until after Talang, when we passed one or two days through almost continuous pine forest, varied here and there by little woods of evergreen oaks. Here, rather to my surprise, I learned that the peacock exists in the wild state, and it is quite common in the forest south of Szemao. These pine forests had not a plant in flower amongst them. I noticed, however, two little woods made up of an *Abies*, new to me, but I only found one cone. However, I am not pretending now to give any account of the trip botanically, as it would require too much time to get my notes in order at the moment. On the eighteen days I may have collected about thirty plants in flower. At one or two places I might have done a lot of collecting if I could have stayed for a day or two, but I was travelling on official business, and could not tarry.

The main interest of the route was the aborigines, or non-Chinese races. Chinese here and there dwell on the little tracts of good land which are found in the high-lying valleys and plains of the plateau, and I passed through five or six largish towns mainly peopled by Chinese. But the larger part of the population was made up of aborigines. Whether the ethnology of this part of the world will ever be satisfactorily explained is doubtful. There seems to be the same variety in the human being as exists in the vegetable world in the same region, and there is a strange blending of races of Chinese, Malay, Negrito, perhaps even Caucasian here.

The greatly increased interest in China at home will, I hope, give a stimulus to the study of the history of the social evolution of the Chinese, which is calculated to bring out many important lessons for ourselves. There have been, as it were, two parallel developments of the human race, one on the west of Europe-Asia, the other on the east side, very little dependent on each other. At the start, the Chinese seem to have been fairly equal to the Westerners; and even in the middle ages, judging from the way in which mediaeval travellers wrote, Chinese civilisation was quite as good as that of Europe. The decay of manly spirit, brought about by the idea that war is immoral, the low position of woman, the absence of an hereditary aristocracy holding up ideas of honour and probity and constantly acting as a check on philistinism, the government by officials selected by competitive examination in ancient classics and trivialities akin to Latin verse, all these causes must have been acting disastrously to have brought an intelligent race into such a low position.

There is a good deal of wooded country at no great distance from Szemao, and the mountains run up to nearly 6000 feet, but there is an absence of the sharp and precipitous kind of mountain and valley, and the flora in consequence is very uniform and not nearly so interesting as Mengtze nor so rich in species. Hills clad with pine and oak are almost barren in interesting plants, and I haven't come on any of those dark ravines and steep wooded cliffs which are the joy of the botanical collector. There is a great absence (perhaps the autumn will make a better show) so far of ferns and herbaceous plants. What one collects is mainly trees and shrubs and climbers. There is a fair number of epiphytic orchids. The common plants are not the common plants of Mengtze, in fact the two floras are very different. Szemao will possibly turn out very like the Shan country where Sir Henry Collett collected, and Indian forms not hitherto recorded from China are frequent enough. One curious thing occurs here as well as at Mengtze, *i.e.* the occurrence of two or three species of the same genus in precisely the same locality and often flowering at the same time.

The woods near Szemao are full of birds, and the notes are exquisite, and to be heard in perfection in these days of showery weather, for the rainy season has begun. When the sun gets out the cicadas start such a racket that one can hear nothing else. I have not told you of the jungle-fowl; this is, I believe, *Gallus bankiva*, the original form of the farmyard fowl. They are very common in the forests and woods here, and are simply gorgeous. They are glorified bantams, the colours having a brilliancy that seems abated in the domesticated kind. They crow and cackle and behave in the woods just as a farmyard fowl would do, only they are a little shyer of man. Occasionally one sees a flying-squirrel, a big black one, sailing in the air from tree to tree, and I saw the other day what I thought was a calf; it turned out to be a red-coloured deer, which speedily bolted with an upturned tail, white beneath like a rabbit's. It is very hard to believe that this particular deer, which only occurs, so far as I know, one or two together, never a herd, derives much advantage in life from this white-signal tail.

In many of the Mengtze and Szemao trees and shrubs the flowers occur on the branches below the leaves, and not on the peripheral surface of the tree, as in ordinary cases. Many lianas have this peculiarity. These are all forest plants, and I think the explanation is that in forests there are two surfaces open to insect-visitors, the top of the forest and the bottom. Some trees and shrubs and climbers cannot get to the top, so they have their flowers at the bottom. But of course this explanation is only a guess. There is no time for me to make any observations of the kind necessary; if one could spend six months on end in a forest, one could observe, measure, &c. The *Mucuna sempervirens* of Ichang was a splendid example of this peculiarity. There was in one specimen a dense wall of foliage climbing over trees, interlaced with them, &c., nearly 200 feet by 100 feet, while the main trunk of the climber close to the ground was covered with

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[1] Abridged from a letter to Mr. Thiselton-Dyer, from Dr. Augustus Henry, published in the Kew *Bulletin* for November (No. 143).

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flowers which were easily visited by thousands of insects of all kinds.

There is quite a little group of shrubs which occur on the banks of rivers (and often in beds of streamlets) that overflow. These shrubs are submerged often and are not hurt. These *fluviatile* shrubs have a certain facies, very difficult to describe. There must be thirty or forty species of them in the Yunnan river valleys. These shrubs do not occur elsewhere than on banks or in the beds of streams. The last one I have found is a very fine species of *Ficus*. This class of shrub would be a nice enough problem for some one to work out.

I hope you will try and get a young Cambridge or Oxford botanist to come to this part of the world, do some naturalist work, and collect seeds and live plants for cultivation. China is a very easy country to travel in, and expenses of travelling are not heavy. The mountainous regions of Yunnan and Szechwan are very healthy besides.

TECHNICAL INSTITUTIONS IN ENGLAND.

The current number of the *Record* of Technical and Secondary Education contains some encouraging statistics with regard to the establishment, extension, and adaptation of permanent technical schools and institutions in England since the passing of the Technical Instruction Act, 1889. The primary object of the inquiry (the results of which are now published) was to ascertain the amount of money sunk in buildings for technical education by local authorities, but some valuable information regarding certain details of organisation was obtained at the same time, and has been incorporated in the article. The statistics do not take into consideration either higher grade schools or schools governed by schemes under the Endowed Schools Acts and other secondary schools; but they refer to all the various types of permanent technical institutions, and, consequently, there are included domestic economy schools, agricultural and horticultural schools and colleges, farm schools, and dairy schools. It was intended to take in university colleges so far as they included technical or agricultural departments, but it is stated that as these institutions are largely non-local in character, supplying certain educational requirements in large areas by reason of the financial assistance of local authorities, they have been excluded. The following summary, given by the *Record*, shows the developments which have taken place, but, as has been mentioned, it only partly represents the progress made since 1889, as it does not take into consideration secondary schools serving the purpose of technical institutes.

The figures which appear under the head of "counties" refer to those institutions which have been directly established, and are being exclusively maintained, by County Councils.

(1) NUMBER OF MUNICIPAL SCHOOLS EXISTING OR IN COURSE OF ESTABLISHMENT:—

	Schools.
(*a*) In 47 county boroughs	71
(*b*) In 130 non-county boroughs and urban districts	132
(*c*) In 30 counties	36
Total number of municipal schools in England	239

This number does not include—(1) those voluntary technical schools which will probably become municipal institutions in the near future, viz. the schools in three county boroughs and three non-county boroughs and urban districts; (2) the municipal classes, held in rented premises, in 29 non-county boroughs and urban districts.

(2) INCREASE IN ANNUAL LOCAL CONTRIBUTIONS FROM THE RATES:—

	Amount voted in 1895-6	1897-8	Increase in Rate-aid.
	£	£	£
(*a*) In 15 county boroughs	7,488	17,429	9,941
(*b*) In 70 non-county boroughs and urban districts ...	6,791	15,960	9,169
In 85 localities	£14,279	£33·389	£19,110

These figures are exclusive of—(1) those relating to Sheffield, where an additional sum of 1000*l.* will be raised by rate during the current year; (2) a total sum of 29,777*l.*, which has been voted from the general rate funds of urban authorities, and applied entirely to *capital* purposes.

(3) TECHNICAL SCHOOLS ESTABLISHED, EXTENDED, ADAPTED, &C., SINCE 1889:—

	County Boroughs.	Non-County Boroughs, &c.	Counties.	Totals.
Number of schools established...	42	89	32	163
" " in course of establishment	12	56	4	72
" " extended or adapted ...	14	46	—	60
" " transferred, purchased, or presented...	29	43	—	72

(4) PROVISION OF SITES FOR TECHNICAL SCHOOLS:—

	County Boroughs.	Non-County Boroughs, &c.	Totals.
(*a*) Sites *purchased* by the local authority ...	20	44	64
(*b*) Sites *given* by the local authority	8	17	25
(*c*) Sites *presented* by private individuals or Trustees ...	7	28	35

(*d*) Sums *involved* in the acquisition of sites	
in 23 county boroughs ...	£122,528
in 66 non-county boroughs and urban districts ...	55,214
Total for 89 localities	£177,742

(5) CAPITAL EXPENDITURE UPON TECHNICAL SCHOOLS SINCE 1889:—

	Total sum involved.	No. of localities.	No. of buildings
	£		
(*a*) County boroughs ...	1,351,193	50	69
(*b*) Non-county boroughs and urban districts	826,376	166	172
(*c*) Counties	112,853	22	26
Totals	2,290,422	238	267

To this sum an amount of 50,229*l.* should be added as representing the value of sites for technical schools presented by local authorities, Trustees, and private individuals in 18 localities, and included under section (4) of this summary; an aggregate amount of 2,340,651*l.* is thus shown as having been absorbed by the establishment of technical institutions in England from the year 1889. It should, however, be pointed out that the figures under (*c*) do not include the sums spent by the County Councils of Cambridgeshire, Lancashire, Warwickshire, and the East, North, and West Ridings of Yorkshire upon their municipal institutions.

Of the funds dealt with above, it is only possible to give the derivation of a sum of 1,854,036*l.*, which is apportioned among the different authorities as follows:—

	County Boroughs.	Non-County Boroughs, &c.	Counties.	Totals.
	£	£	£	£
Loans	657,183	259,047	27,350	943,580
Donations and subscriptions, and Trust funds ...	309,716	178,436	13,567	501,719
Residue grant ...	167,642	92,366	71,936	331,944
Science and Art Department's grants	11,101	35,915	—	47,016
Lump sums from rate fund	18,036	11,741	—	29,777
	£1,163,678	577,505	112,853	1,854,036

In order the more easily to grasp the significance of these figures and to facilitate comparison, it may be well to present the following table of percentages:—

	County Boroughs. Per cent.	Non-County Boroughs, &c. Per cent.	Counties. Per cent.
Loans	56½	45	24¼
Donations and subscriptions and Trust funds ...	26¾	31	12
Residue grant	14¼	16	63¾
Science and Art Department's grants and lump sums from rate fund ...	2½	8	—
Per cent.	100	100	100

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